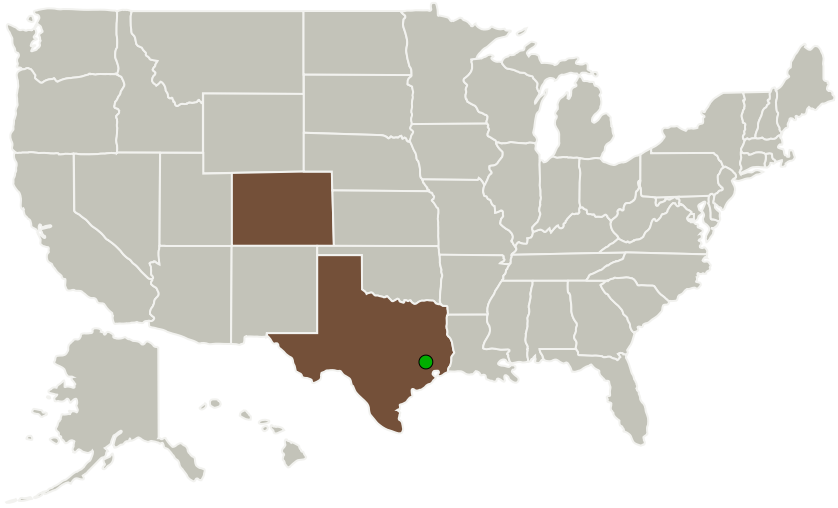
Chromatid Painting for Chromosomal Inversion Detection, Phase II

Completed Technology Project (2010 - 2011)

Project Introduction

We propose the continued development of a novel approach to the detection of chromosomal inversions. Transmissible chromosome aberrations (translocations and inversions) have profound genetic effects, such as disrupting regulatory sequences that control gene expression, or creating genetic chimeras. These chromosome aberrations play a causative role in cancer, and ionizing radiation is one of the most efficient agents known to induce them. As such, chromosome aberrations are relevant to three NASA needs, biodosimetry, analysis of astronaut lymphocytes for cumulative radiation damage, and space radiation risk modeling. Of all structural chromosomal anomalies, inversions ⬌ a reversal of orientation of material within a chromosome ⬌ are the most difficult to detect. This is especially true of small inversions, most of which are invisible to all current cytogenetic techniques. Yet small inversions are likely the most transmissible (nonlethal) form of chromosomal damage, so they persist for long periods. This is a useful feature for retrospective biodosimetry, and may also prove to be useful as an indicator of radiation quality.. In Phase 1 we demonstrated the use of a human chromosome 3, partial chromatid paint to detect a known inversion. During Phase 2, we will continue to improve the efficiency of the technology, an essential goal for commercialization (Phase 3) ultimately creating an improved and complete chromatid paint for chromosome 3. Finally, we will test the chromosome 3 'chromatid paint's' ability to detect radiation-induced inversions, and establish their frequency. The technology readiness level at the end of the Phase 2 contract is expected to be 5, i.e. validated in laboratory and relevant environments.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
KromaTiD, Inc.	Lead Organization	Industry	Fort Collins, Colorado
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Colorado	Texas

Project Transitions

January 2010: Project Start

April 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138860)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

KromaTiD, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

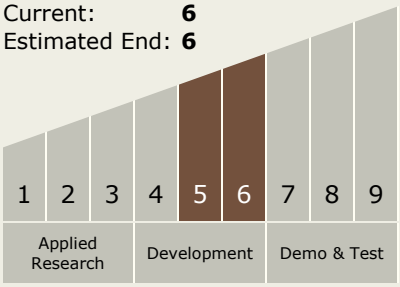
Carlos Torrez

Principal Investigator:

Edwin Goodwin

Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.1 Medical Diagnosis and Prognosis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System